

REMARKS

Claims 1-7 are pending. Claims 1, 2 and 4 are objected to. Claims 1, 3 and 4 are rejected. Claims 5-7 have been withdrawn from consideration. Claims 1, 3 and 4 are amended. Support for the amendments and new claims can be found throughout the application, for instance in the specification and claims as originally filed. No new matter is added. Claims 1-4 are submitted for further consideration at this time. Applicants respectfully request reconsideration and withdrawal of all rejections.

Election/Restriction

Affirmation of the election of Group I, claims 1-4 is requested. Applicants affirm the election of claims 1-4 for prosecution on the merits.

Specification

The Abstract is objected to. Applicants respectfully point out that the objection is moot in view of the Abstract amendment indicated herein.

The specification is also objected to. However, Applicants respectfully submit that they are unable to find any grammatical errors in paragraphs [0024] and [0025], as is alleged at page 6 of the Office Action. Additional review of the

specification did not uncover any such errors as alleged. Applicants therefore urge that this objection is also moot.

Applicants respectfully request withdrawal of all objections.

Claim Objections

Claims 1, 2 and 4 are objected to for informalities. Applicants respectfully submit that all claim objections are moot in view of the claim amendments indicated herein. Applicants point out that the amendments are made simply to clarify the claimed invention and not change any claim scope. Applicants again urge withdrawal of all objections.

Claim Rejections - 35 U.S.C. §112

Claims 1 and 3 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. It is alleged that the phrase "high saturation" is unclear. Applicants respectfully disagree. The claimed invention as set forth in claim 1 includes at least 40 parts by weight of an ethylenically unsaturated nitrile conjugated diene type highly saturated rubber in which the content of conjugated diene units in the polymer chain is not higher than 30 % by weight. Applicants therefore submit that those of ordinary skill in the art would clearly recognize what is meant by "high saturation" as

set forth in the claims and described throughout the specification. Applicants urge withdrawal of the rejection.

Claim Rejections - 35 U.S.C. §103

Claims 1, 3 and 4 are rejected under 35 U.S.C. §103(a) as being obvious over JP 09-143306 A (hereinafter “JP 306”) in view of JP 08-269241 (hereinafter “JP 241”), Saito et al. (U.S. Patent No. 4,990,570) and Teramoto et al. (U.S. Patent No. 4,313,865).

Claims 1-4 are also rejected under 35 U.S.C. §103(a) as being obvious over JP 306 in view of JP 241, Saito et al. and Horowitz et al. (U.S. Patent No. 4,051,090).

Applicants respectfully disagree. The present invention as set forth in claim 1 is concerned with a rubber laminate comprising: a rubber composition (A), obtained by blending 0 to 120 parts by weight of zinc methacrylate and an organic peroxide into a total of 100 parts by weight of rubber ingredients including at least 40 parts by weight of an ethylenically unsaturated nitrile conjugated diene type highly saturated rubber in which the content of conjugated diene units in the polymer chain is not higher than 30 % by weight, and a sulfur vulcanizable diene-based rubber composition (B) bonded by vulcanization through a bonding rubber composition (C), wherein the bonding rubber composition (C) is comprised of 100 parts by weight of a rubber containing 50 to 85 parts by weight of at least one type of diene-based rubber selected from a group consisting of natural rubber, polyisoprene rubber, polybutadiene rubber, and a

conjugated diene-aromatic vinyl copolymer; 15 to 50 parts by weight of an ethylenically unsaturated nitrile-conjugated diene type highly saturated rubber in which the content of conjugated diene units in the polymer chain is not higher than 30% by weight; 10 to 60 parts by weight of zinc methacrylate; 0.3 to 10 parts by weight of an organic peroxide; and 5 to 50 parts by weight of a co-cross-linking agent having one of an acryl group, methacryl group and allyl group, wherein the co-cross-linking agent is liquid at room temperature.

That is, the claimed invention may be characterized as providing a rubber laminate while greatly improving bonding strength at high temperature and under high strain, though a particular formulation of bonding rubber composition (C), as claimed, between a rubber composition (A) of an ethylenically unsaturated nitrile conjugated diene type highly saturated rubber composition in which the content of conjugated diene units in the polymer chain is not higher than 30% by weight (hereinafter "hydrogenated NBR composition") and a sulfur vulcanizable diene-based rubber composition (B).

Applicants urge that no such invention as claimed is taught or suggested by any combination of the cited references. JP 306 discloses a rubber laminate comprising (A) a rubber composition optionally comprising zinc methacrylate and an organic peroxide in a nitrile rubber, and (B) a sulfur vulcanized diene-based rubber composition, bonded by vulcanization through a bonding composition (C) comprising (a) at least one diene-based rubber selected from the group of conjugated diene-aromatic vinyl copolymer, natural rubber, synthetic polyisoprene rubber and butadiene rubber; (b) an acrylonitrile-butadiene copolymer; and (c) an aromatic petroleum resin having average molecular weight of 300-1500, softening temperature of 50-160°C and iodine number of equal to

or more than 5g/100g and/or (d) coumarone resin. However, Applicants note that the in the claimed invention, the bonding strength between the different rubber compositions (A) and (B) is further strengthened by partially exchanging the ingredients in the bonding rubber compound (C). See effects of Example 1 and Comparative Example 1 at Table 1. Accordingly, at the very least there are substantial differences in the selection of the ingredients of the bonding rubber compound (C) of the claimed invention and JP 306. Indeed, it is admitted at page 9 of the Office Action that JP 306 fails to teach or suggest bonding rubber composition (C) as claimed. Moreover, Applicants point out that the claimed invention requires a given weight part of a particular diene-based rubber, a particular hydrogenated NBR composition, zinc methacrylate, organic peroxide and a co-cross-linking agent having one of an acryl group, methacryl group and allyl group, wherein the co-cross-linking agent is liquid at room temperature. In contrast, the disclosure of JP 306 comprises a given weight part of (a) a particular diene-based rubber, (b) a particular acrylonitrile-butadiene copolymer rubber (i.e., not a hydrogenated NBR composition) and (c) an aromatic petroleum resin having an average molecular weight of 300 - 1500, a softening temperature of 50 - 160°C and the iodine number of equal to or more than 5g/100g and/or (d) coumarone resin.

JP 241 discloses a rubber composition containing a given weight of (i) an ethylenically unsaturated nitrile-conjugated diene type highly saturated rubber in which the content of conjugated diene units in the polymer chain is not higher than 30% by weight, (ii) zinc methacrylate, (iii) polybutadiene in which the bonding content of 1, 2-binyl units in the butadiene chain is higher than 45% by parts and/or styrene-butadiene copolymer, and (iv) an organic peroxide. JP 241 also teaches that such a

composition offers a high hardness and good adhesion to sulfur vulcanized rubber layers. However, JP 241 discloses only a rubber composition which enables a direct bond to a general diene-based rubber, failing to teach or suggest that the rubber composition may be used as a good bonding rubber interlayer between a hydrogenated NBR rubber and a diene-based rubber. Moreover, the formulation of the rubber composition used in JP 241 invention is different from that of the bonding rubber composition (C) of the claimed invention. That is, the formulation of JP 241 includes a polybutadiene in which the bonding content of 1,2-binyl units in the butadiene chain is higher than 45% by parts and/or styrene-butadiene copolymer, which is quite different from the diene-based rubber ingredients used in the bonding rubber composition (C) as claimed. Moreover, the formulation of JP 241 fails to teach or suggest a co-cross-linking agent having one of an acryl group, methacryl group and allyl group, wherein the co-cross-linking agent is liquid at room temperature, as is required in the bonding rubber composition (C) as claimed.

Therefore, the combination of the primary JP 306 and JP 241 references is unable to teach or suggest any bonding rubber composition (C) and hydrogenated NBR composition as claimed. As discussed below, the secondary references Saito et al., Teramoto et al. and Horowitz et al. are unable to cure such deficiencies of JP 306 and JP 241.

Saito et al. discloses a curable rubber composition comprising (a) 100 parts by weight of an ethylenically unsaturated nitrile/conjugated diene type highly saturated rubber in which the content of conjugated diene units in the polymer chain is not higher

than 30% by weight, (b) 10 to 100 parts by weight of a zinc salt of methacrylic acid, (c) 5 to 50 parts by weight of silicic anhydride, and (d) 0.2 to 1.0 parts by weight of an organic peroxide. The curable rubber composition is alleged to have excellent strength, abrasion resistance, and resistance to compression set. However, Applicants point out that there is quite a difference in formulation of the curable rubber composition of Saito et al. and the rubber composition (A), the hydrogenated NBR composition, of the claimed invention. Moreover, while the curable composition of Saito et al. includes the ingredient (c) silicic anhydride, the claimed invention does not require any such ingredient. Perhaps more important, Saito et al. quite clearly fails to teach or suggest that its curable rubber composition may be used as an outer layer of a laminate comprising a hydrogenated NBR composition and a diene-based rubber composition bonded by vulcanization through a bonding rubber composition, in accordance with the claimed invention.

Teramoto et al. discloses instant setting adhesive compositions, which are improved in impact resistance, peel resistance, heat resistance and water resistance, comprising a 2-cyanoacrylate and at least one 1,1-disubstituted diene. The reference also discloses that these adhesives are utilized in various fields, because they are single-component liquid adhesives of the non-solvent type having the specific property of polymerizing instantaneously at room temperature in the presence a minute amount of moisture existing on the surface of adherents or in the air to bond metals, plastics, and the like. However, Applicants point out that Teramoto et al. discloses only the simple use of an instant setting adhesive composition comprising a 2-cyanoacrylate and

at least one 1,1-disubstituted diene. Teramoto et al. provides absolutely no teaching or suggestion with respect to using such an adhesive composition in, for example, a bonding composition (C) as claimed, to bond between a hydrogenated NBR composition and a diene-based rubber composition, as in the claimed invention.

Horowitz et al. discloses a motor vehicle tire having a tire casting 2 and a tread band 3 secured together by an interposed layer 4 of adhesive. Horowitz et al. also discloses an interposed layer including co-crosslinking agent to diene-based rubber compositions, wherein the co-crosslinking agent comprises acryl, methacryl or allyl groups and is liquid at room temperature, in order to improve the adhesive bonding between elastomeric substrates (i.e., a tire casting 2 and a tread band 3). Applicants point out, however, that Horowitz et al. contains no teaching or suggestion with respect to addressing the problem of strengthening the bonding properties between a particular hydrogenated NBR composition and a diene-based rubber composition, as in the claimed invention. Accordingly, Horowitz et al. also fails to teach or suggest an elastomeric substrate comprised of a hydrogenated NBR composition, or that its interposed layer may include any of ingredients of a hydrogenated NBR composition, zinc methacrylate and an organic peroxide. Horowitz et al. is simply unable to cure the deficiencies of the remaining references.

Applicants therefore urge that no combination of the cited references is able to teach or suggest the claimed invention, and requests withdrawal of all rejections.

In addition, regarding claim 3, Applicants wish to point out that the claimed invention is capably of remarkably improved results, as described throughout the

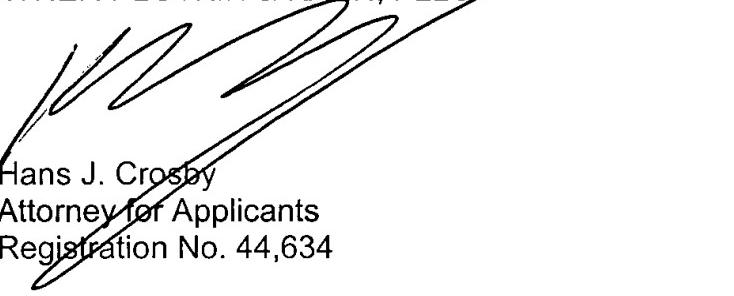
specification, by first mixing the ethylenically unsaturated nitrile-conjugated diene type highly saturated rubber in which the content of conjugated diene units in the polymer chain is not higher than 30% by weight with zinc methacrylate, and then mixing this composition with the diene-based rubber and other compounding agents. See Examples 3 (one-step mixing method) and 4 (two- step mixing method) at Table 1. With respect to claim 4, Applicants note that the claimed invention is capable of remarkably improved results, by further including 5 to 50 parts by weight of an aromatic petroleum resin having an average molecular weight of 300 to 1500, a softening point of 50 to 160°C, and an iodine absorption value of at least 20g/100g. See Example 3 and Example 4 at Table 1.

Therefore, Applicants again submit that no teaching or suggestion of the claimed invention, much less the remarkably improved results of the claimed invention, can be found in any combination of the cited references. All rejections should be withdrawn.

In view of the amendments and remarks above, Applicants submit that this application is in condition for allowance and request favorable action thereon.

In the event this paper is not timely filed, Applicants hereby petition for an appropriate extension of time. The fee for this extension may be charged to our Deposit Account No. 01-2300, along with any other additional fees which may be required with respect to this paper referencing Attorney Docket No. 100021-00055.

Respectfully submitted,
ARENT FOX KINTNER PLOTKIN & KAHN, PLLC



Hans J. Crosby
Attorney for Applicants
Registration No. 44,634

Customer No. **004372**
1050 Connecticut Avenue, N.W., Suite 400
Washington, D.C. 20036-5339
Tel: (202) 857-6000
Fax: (202) 638-4810

HJC/ccd